PTO/SB/17 (01-03)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

FEE TRANSMITTAL for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($)

Complete if Known	
Application Number	09/615,019
Filing Date	July 13, 2000
First Named Inventor	George F. Kirkman
Examiner Name	Nguyen, K. V.
Art Unit	2817
Attorney Docket No.	PD-990235 (BOE 0222 ROA)

METHOD OF PAYMENT *(check all that apply)*

☑ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☑ Deposit Account

Deposit Account Number: 50-0476

Deposit Account Name:

The Commissioner is authorized to: *(check all that apply)*

☐ Charge fee(s) indicated below ☐ Credit any overpayments

☑ Charge any additional fee(s) during the pendency of this application

☐ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

		Extra Claims		Fee from below	Fee Paid
Total Claims		-20** =		X	=
Independent Claims		- 3** =		X	=
Multiple Dependent					=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple dependent claim, if not paid
1204	84	2204	42	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	320.00
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	650	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	2809	375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 320.00

SUBMITTED BY

(Complete *if applicable*)

Name (Print/Type)	Jeffrey J. Chapp	Registration No. (Attorney/Agent)	50,579	Telephone	248-223-9500
Signature				Date	February 13, 2003

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:

George F. Kirkman

Serial No.: 09/615,019 Group Art Unit: 2817

Filed: July 13, 2000 Examiner: Nguyen, Khanh V.

For: LINEARIZED TRAVELING WAVE TUBE CIRCUIT WITH PRE-DISTORTION LINEARIZER

Attorney Docket No.: PD-990235 (BOE 0222 ROA)

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents and Trademarks, Box AF, Washington, D.C. 20231 on

February 13, 2003 (Date of Deposit) Jo Anne Croskey

(Signature)

BRIEF ON APPEAL

Commissioner for Patents and Trademarks
Box AF
Washington, D.C. 20231

Sir:

The following is an Appeal Brief pursuant to the Notice of Appeal filed on January 29, 2003, for the above-identified application. The Appeal Brief is being submitted in triplication to comply with the provisions of 37 CFR 1.19(c).

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I. Real Party in Interest

The real party in interest in this matter is The Boeing Company in Chicago, Illinois (hereinafter "Boeing").

II. Related Appeals and Interferences

There are no other known appeals or interferences, which will directly affect or be directly affected by or have bearing on the Board's decision in the pending appeal.

III. Status of the Claims

Claims 1-2, 4, and 6-19 stand rejected in the Final Office Action. A copy of the claims on appeal is attached as an Appendix.

IV. Status of Amendments Filed after Final

There have been no amendments filed subsequent to the final rejection.

V. Summary of the Invention

The present invention is directed to a traveling wave tube circuit assembly 32 that includes a traveling wave tube 44. A predistortion network 42 is radio frequency (RF) coupled to the traveling wave tube 44. The predistortion network 42 is disposed in a high temperature zone 50. The predistortion network 42 is also coupled to an amplifier 36 via a connecting cable 40. Claims 1-19 encompass several points of novelty. Independent claims 1, 12, and 19 encompass a key point of novelty, and since claims 2, 4, 6-11, 13-18 depend from claims 1 and 12, respectively,

they also contain at least the same key point of novelty, see specification pages 4-5 and Figure 2.

Independent claims 1, 12, and 19 are similar and therefore will be discussed together. Claims 1 and 12 are directed towards the traveling wave tube circuit assembly 32 whereas claim 19 is directed towards a satellite 30 having similar limitations as that of claims 1 and 12. The limitations of claim 1 are stated above. The limitations of claims 12 and 19 differ from that of claim 1 in that the traveling wave tube 44 is further coupled in series with the predistortion network 42, the amplifier 36 is within a low temperature zone 48, and the connecting cable 40 is a RF connecting cable and couples the low temperature zone 48 to the high temperature zone 50.

Applicant has admitted in the background art section of the present application that prior art has included a low temperature zone 22 having a predistortion network 14 and an amplifier 16. A traveling wave tube 18 within a high temperature zone 24 is coupled to the predistortion circuit 14 and the amplifier 16 via a RF connecting cable 20, see specification pages 1-2 and prior art Figure 1. What is not known or suggested, is the several novel aspects of the present invention. All of the novel aspects of the present invention are not taught or suggested by the prior art separately or in combination. The novel aspects are described in detail below.

What is not known or suggested is the key novel aspect of the present invention in having a predistortion network disposed within a high temperature zone rather than within a low temperature zone of a traveling wave tube circuit, as claimed by independent claims 1, 12, and 19. The predistortion network 42, of the present invention, is located at an output side of the connecting cable 40 as opposed to an input side of the connecting cable 40. In so doing, the present invention eliminates the effect of the connecting cable 40 on design of the traveling wave tube circuit 32. Length of the connecting cable 40 can be altered to accommodate various designs without altering alignment thereof and causing a need for the circuit 32 to be realigned. Additionally, by having the predistortion network 42 in the high temperature zone 50, the present invention increases operating reliability of the circuit 32 due to a reduced desired operating range of any field effect transistors that exist in the network 42.

Furthermore, the prior art does not teach or suggest the predistortion network 42 having a first limiter 52, a first attenuator 54, a phase shifter 56, and a second attenuator 58, all of which located within the high temperature zone 50, see specification pages 5-6 and Figure 3. The first limiter 52 has power levels suitable for inputs to the traveling wave tube 44, thus eliminating need for an amplifier between the predistortion network 42 and the traveling wave tube 44.

Additionally, the prior art does not teach or suggest the predistortion network 42 having a third attenuator 66 and a second limiter 68 coupled in series with each other and in parallel with the first limiter 52, the first attenuator 54, and the phase shifter 56, see specification page 7 and Figure 9. The third attenuator 66 and the second limiter 68 serve to protect the traveling wave tube 44 from excessive levels of input power. The third attenuator 66 and the second limiter 68 are also located within the high temperature zone 50.

Moreover, the prior art does not teach or suggest the predistortion network 42 having the multiple attenuators 54, 58, and 66 located within the high temperature zone 50 and having the capability of being adjusted to allow the predistortion network 42 to be used with a family of different traveling wave tubes with varying input powers.

Claim 2 further limits claim 1 by reciting that the amplifier 36 is disposed in the low temperature zone 48.

Claim 4 further limits claim 1 by reciting that the predistortion network 42 includes the limiter 52.

Claims 6 and 13 further limit claims 1 and 12 by reciting that the predistortion network 42 includes the first limiter 52, the first attenuator 54 coupled in series with the first limiter 52, and a phase shifter 56 coupled in series with the first attenuator 54.

Claims 7 and 14 further limit claims 6 and 13 by reciting that the predistortion network 42 includes a second attenuator 58 coupled in series with the phase shifter 56.

Claims 8 and 15 further limit claims 6 and 13 by reciting that the predistortion network 42 includes a transmission line 60 coupled parallel to the limiter 52, the first attenuator 54, and the phase shifter 56.

Claims 9 and 16 further limit claims 8 and 15 by reciting that the transmission line 60 has a third attenuator 66.

Claims 10 and 17 further limit claims 9 and 16 by reciting that the predistortion network 42 includes a second limiter 68 coupled in series with the third attenuator 66.

Claims 11 and 18 further limit claims 1 and 12 by reciting the inclusion of a second amplifier 38 coupled in series with the first amplifier 36.

VI. Issues

The following issues are presented in this appeal, each of which correspond directly to the Examiner's final grounds for rejection in the Advisory Action and in the final Office Action:

Whether claims 1-2, 4, 6, 8-13, and 15-19 are patentable under 35 U.S.C. § 103(a) as being unpatentable over applicants' admitted PRIOR ART (Figure 1) in view of Vaughn et al. (5,703,531).

VII. Grouping of Claims

The rejected claims have been grouped together by the Examiner in the rejection. The Applicant states, however, that each of the rejected claims stand on its own recitation and is separately patentable for the reasons set forth in detail below.

VIII. Argument

THE REJECTION OF CLAIMS 1-2, 4, 6, 8-13, AND 15-19 UNDER 35 U.S.C. § 103(a)

Claims 1, 12, and 19 stand fully rejected under 35 U.S.C. § 103(a) as being unpatentable over applicants' admitted prior art in view of Vaughn. Generally, claims 1, 12, and 19 are similar in basic scope so the following argument applies equally to the stated claims.

The Applicant's prior art is directed towards a device including an RF amplifier 12 coupled in series with a predistortion network 14. The predistortion network 14 is coupled to a second RF amplifier 16, which is coupled to a traveling wave tube amplifier 18 by an RF connecting cable 20. The RF amplifiers 12 and 16 and the predistortion network 14 are located in a low temperature zone 22. The traveling wave tube 18 is positioned in a high temperature zone 24.

The Vaughn reference is directed to a predistortion linearizer 20 that includes a dielectric plate substrate 46. A divider 22 and a signal combiner 38 reside on the plate substrate 46. A first slotline 24 and a second slotline 26 represent divider

output and signal combiner input legs. The first slotline 24 is linear and having a first limiter 28, a first attenuator 30, and a phase adjuster 32. The second slotline 26 is nonlinear and has a second limiter 34 and a second attenuator 36. The limiters 28 and 34, the attenuators 30 and 36, and the phase shifter 32 adjust relative amplitude and phase between the lines 24 and 26. The predistortion linearizer 20 separates linear and non-linear portions of an input signal with 0° offset between portions and then combines the linear and non-linear portions having a 180° offset therebetween. Appropriate predistortion is created for a downstream amplifier, as shown in the Applicant's prior art with amplifier 16, or other device.

Vaughn is directed to counteracting and canceling effects of nonlinear amplification, as stated in col. 1, lines 24-29 and lines 58-61. Vaughn predistorts a microwave signal before amplification and transmission thereof. Predistortion of the microwave signal before amplification thereof results in a desired linear transmission signal. Thus, Vaughn's intended use is similar to the predistortion network 14 of the Applicant's prior art.

Neither the Applicant's prior art or the Vaughn reference teach or suggest use of a predistortion network within a high temperature zone of a traveling wave tube circuit. Thus, neither reference provide a traveling wave tube circuit that provides for circuit design changes without need for realignment with a specific cable length. The present invention by having the predistortion network 42 within the high

temperature zone 50 eliminates the effect of design changes to the connecting cable 40.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation to modify or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art references when combined must teach or suggest all of the claimed limitations, as stated in MPEP 706.02(j). As for the first element no such suggestion or motivation is provided by the Examiner or is stated in the Applicant's prior art or in the Vaughn reference, thus the second element is not even considered. In respect to the third and final element and as is stated below, the Applicant's prior art and the Vaughn reference in combination do not teach or suggest all of the claimed limitations of the present invention.

The Examiner relies on the Vaughn reference for the limitation of a predistortion network within a high temperature zone of a traveling wave tube circuit and in doing so states that since Vaughn discloses Schottky limiter diodes and PIN diodes that are capable of operating in higher temperatures it would have been obvious to modify and operate the predistortion network of the Applicant's prior art in a high temperature zone.

Nowhere in the Vaughn reference is operation within various temperatures discussed. Although, the Schottky limiter diodes and PIN diodes of Vaughn may have been used for various durability, reliability, or performance reasons, it is not clear from the Vaughn reference why suggested use of these components is preferred. Thus, to assume that purely since Vaughn utilizes Schottky limiter diodes or PIN diodes that the advantages associated with utilizing these diodes in the modification of a predistortion network as well as the advantages of modifying a traveling wave tube circuit, as described by the present invention, are known, Applicant respectfully believes that this is improper hindsight reasoning. Although, a component within a reference device is capable of operating within a desired temperature range, that does not render obvious the modification of a network separate and different from the stated device using a similar component as that contained within the stated device and modifying a circuit, which includes the modified network and the stated device. In other words, although the Vaughn reference includes a component that is capable of operating at a high temperature, there is no suggestion in either the Applicant's prior art or in Vaughn to modify the predistortion network 14 of Applicant's prior art to include that component and to modify the location and arrangement of devices within Applicant's prior art to arrive at the present invention.

The Examiner states that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. Zone temperature is not discussed anywhere in Vaughn, thus actually operating and being located in a high temperature zone and the advantages accompanied therein are also not suggested or taught. Modification to the predistortion network 14 and to the location and arrangement of devices of the Applicant's prior art, as described by the present invention, is not knowledge, which was within the level of ordinary skill at the time the claimed invention was made.

The Examiner in the final Office Action uses the Vaughn reference to show why it is preferable to utilize a predistortion network in a high temperature zone and in the non-final Office Action, of June 6, 2002, the Examiner states such a modification would impart the advantageous benefit of improved linearity, broad band performance, light weight, compact, and suitable for a range of application, thereby suggesting the obviousness of such a modification. Although, the Vaughn reference may provide these stated advantages, the Vaughn reference does not state or suggest that modification of a predistortion network and associated location and arrangement of traveling wave tube devices would provide these stated advantages,

nor does the Vaughn reference or a combination with the Applicant's prior art provide the advantages of the present invention, which are different from that of the stated advantages of Vaughn. Namely, Applicant's prior art and the Vaughn reference to not provide alone or in combination a circuit having the advantage of being able to alter design and length of a connecting cable between a low temperature zone and a high temperature zone without a need for realignment therein, let alone other above-stated advantages of the present invention.

Prior art references, as stated in MPEP 2143.01, must suggest the desirability of the claimed invention. The Examiner relies on Vaughn to show such desirability, where no such desirability exists. Also, continuing from above in MPEP 2143.01, the mere fact that the claimed invention is within the capabilities of one of ordinary skill in the art is not sufficient by itself to establish *prima facie* obviousness. Even when the references relied upon teach that all aspects of the claimed invention were individually known in the art, this is not sufficient to establish a prima facie case of obviousness without some objective reasoning to combine the teachings of the references, Ex parte Levengood, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). Although, the circuit of Applicant's prior art and use of PIN diodes within a predistortion linearizer were known at the time of the present invention, the references do not teach all aspects of the present invention and there is no suggestion

or stated desire to combine these references in some manner and through some modifications to arrive at the present invention.

Therefore, claims 1, 12, and 19 are believed to be allowable since the Applicant's prior art and the Vaughn reference, alone or in combination, do not teach or suggest each and every element or a combination thereof within each of these claims. This is especially true, since the Applicant's prior art and the Vaughn reference do not teach or suggest the use of a predistortion network in a high temperature zone as well as the corresponding modifications to the predistortion network and to a traveling wave tube circuit as described by the present invention.

Claim 2 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 1 and recites the further limitation of the amplifier being disposed in a low temperature zone. Neither of the references teach this combination.

Claim 4 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 1 and recites the further limitation that the predistortion network includes a limiter. Neither of the references teach this combination.

Claims 6 and 13 are believed to be independently patentable and allowable for the reasons set forth above since they depend from claims 1 and 12, respectively, and recite the further limitation that the predistortion network includes a first

limiter, a first attenuator coupled in series with the first limiter, and a phase shifter coupled in series with the first attenuator.

Claims 8 and 15 are believed to be independently patentable and allowable for the reasons set forth above since they depend from claims 6 and 13, respectively, and recite the further limitation that the predistortion network includes a transmission line coupled parallel to the limiter, the first attenuator, and the phase shifter.

Claims 9 and 16 are believed to be independently patentable and allowable for the reasons set forth above since they depend from claims 8 and 15, respectively, and recite the further limitation that the transmission line has a third attenuator.

Claims 10 and 17 are believed to be independently patentable and allowable for the reasons set forth above since they depend from claims 9 and 16, respectively, and recite the further limitation that the predistortion network includes a second limiter coupled in series with the third attenuator.

Claims 11 and 18 are believed to be independently patentable and allowable for the reasons set forth above since they depend from claims 1 and 12, respectively, and recite the further limitation the inclusion of a second amplifier coupled in series with the first amplifier.

IX. The Allowability of Claims 7 and 14

Claims 7 and 14 although are agreed to be allowable if rewritten in independent form to include all of the limitations of the base claim and any intervening claims, rewriting of claims 7 and 14 is believed not to be necessary since they depend from believed to be allowable claims 6 and 13, respectively, and recite the further limitation that the predistortion network includes a second attenuator coupled in series with the phase shifter.

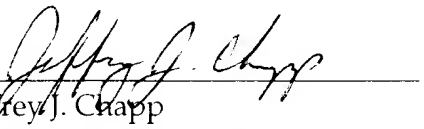
X. Appendix

A copy of each of the claims involved in this Appeal, namely, claims 1, 2, 4, and 6-19, are attached hereto as Appendix A.

XI. Conclusion

For the foregoing reasons, Applicant respectfully requests that the Board direct the Examiner in charge of this examination to withdraw the rejections.

Respectfully submitted



Jeffrey J. Chapp
Registration No. 50,579

Dated: February 13, 2003

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APPENDIX A

1. A traveling wave tube circuit assembly comprising a traveling wave tube:

a predistortion network RF coupled to the traveling wave tube, said predistortion network disposed in a high temperature zone;

an amplifier;

a connecting cable coupling the amplifier to the predistortion network.

2. An assembly as recited in claim 1, wherein said amplifier is disposed in a low temperature zone.

4. An assembly as recited in claim 1, wherein said predistortion network comprises a limiter.

6. An assembly as recited in claim 1, wherein said predistortion network comprises:

a first limiter;

a first attenuator coupled in series with said first limiter; and

a phase shifter coupled in series with said first attenuator.

7. An assembly as recited in claim 6, wherein said predistortion network further comprises a second attenuator coupled in said series with said phase shifter.

8. An assembly as recited in claim 6, wherein said predistortion network further comprises a transmission line coupled parallel to said limiter, said first attenuator and said phase shifter.

9. An assembly as recited in claim 8, wherein said transmission line has a third attenuator.

10. An assembly as recited in claim 9, wherein said predistortion network further comprises a second limiter coupled in series with said third attenuator.

11. An assembly as recited in claim 1, further comprising a second amplifier coupled in series with said first amplifier.

12. A traveling wave tube circuit assembly comprising:

a high temperature zone having a predistortion network; and

a traveling wave tube coupled in series with the predistortion network;

a low temperature zone having an RF amplifier; and

an RF connecting cable coupling said low temperature zone and said high temperature zone.

13. An assembly as recited in claim 12, wherein said predistortion network comprises:

a first limiter;

a first attenuator coupled in series with said first limiter; and

a phase shifter coupled in series with said first attenuator.

14. An assembly as recited in claim 12, wherein said predistortion network further comprises a second attenuator coupled in said series with said phase shifter.

15. An assembly as recited in claim 12, wherein said predistortion network further comprises a transmission line coupled parallel to said limiter, said first attenuator and said phase shifter.

16. An assembly as recited in claim 12, wherein said transmission line has a third attenuator.

17. An assembly as recited in claim 12, wherein said predistortion network further comprises a second limiter coupled in series with said third attenuator.

18. An assembly as recited in claim 12 further comprising a second RF amplifier coupled in series with said first RF amplifier.

19. A satellite comprising:

a high temperature zone having a predistortion network; and

a traveling wave tube coupled in series with the predistortion network;

a low temperature zone having an RF amplifier; and

an RF connecting cable coupling said low temperature zone and said high temperature zone.